Rockets for Extended Source Soft X-ray Spectroscopy

Active Technology Project (2018 - 2022)

Project Introduction

The soft X-ray background surrounds our local galactic environment yet very little is known about the physical characteristics of this plasma. A high-resolution spectrum could unlock the properties of this million degree gas but the diffuse, low intensity nature of the background have made it difficult to observe, especially with a dispersive spectrograph. Previous observations have relied on X-ray detector energy resolution which produces poorly defined spectra that are poorly fit by complex plasma models. Here we propose a series of suborbital rocket flights that will begin the characterization of this elusive source through high-resolution X-ray grating spectroscopy. The rocket-based spectrograph can resolve individual emission lines over the soft X-ray band and place tight constraints on the temperature, density, abundance, ionization state and age of the plasma. These payloads will draw heavily from the heritage gained from previous rocket missions, while also benefiting from related NASA technology development programs. The Pennsylvania State University (PSU) team has a history of designing and flying spectrometer components onboard rockets while also being scientific leaders in the field of diffuse soft X-ray astronomy. The PSU program will provide hands-on training of young scientists in the techniques of instrumental and observational X-ray astronomy. The proposed rocket program will also expose these researchers to a full experiment cycle – design, fabrication, tolerance analysis, assembly, flight-qualification, calibration, integration, launch, and data analysis – using a combination of technologies suitable for adaptation to NASA's major missions. The PSU program in suborbital X-ray astronomy represents an exciting mix of compelling science, heritage, cutting-edge technology development, and training of future scientists.

Anticipated Benefits

The Astrophysics Research and Analysis program (APRA) supports suborbital and suborbital-class investigations, development of detectors and supporting technology, laboratory astrophysics, and limited ground based observing. Basic research proposals in these areas are solicited for investigations that are relevant to NASA's programs in astronomy and astrophysics, including the entire range of photons, gravitational waves, and particle astrophysics. The emphasis of this solicitation is on technologies and investigations that advance NASA astrophysics missions and goals.

Rockets for Extended Source Soft X-ray Spectroscopy

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

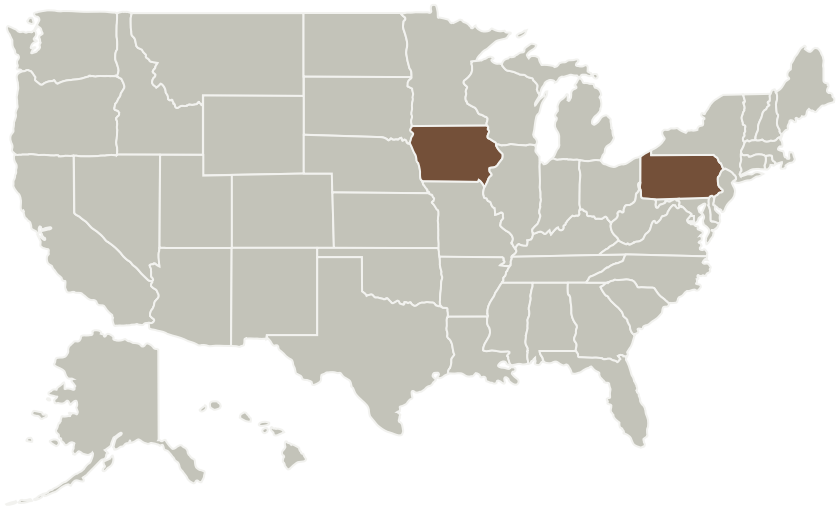
Responsible Program:

Astrophysics Research and Analysis

Rockets for Extended Source Soft X-ray Spectroscopy

Active Technology Project (2018 - 2022)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Pennsylvania State University-Main Campus(Penn State)	Supporting Organization	Academia	University Park, Pennsylvania
University of Iowa	Supporting Organization	Academia	Iowa City, Iowa

Primary U.S. Work Locations	
Iowa	Pennsylvania

Project Management

Program Director:
Michael A Garcia

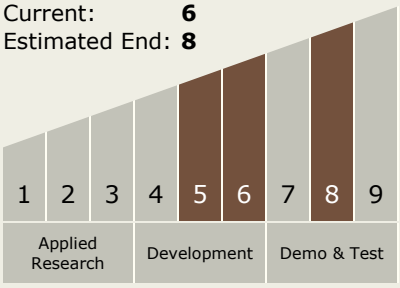
Program Manager:
Dominic J Benford

Principal Investigator:
Randall L Mcentaffer

Co-Investigators:
James H Tutt
Abe Falcone
David N Burrows
Melissa T Gensimore

Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **8**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.X Other Sensors and Instruments

Rockets for Extended Source Soft X-ray Spectroscopy

Active Technology Project (2018 - 2022)

Target Destination

Outside the Solar System